REMARKS/ARGUMENTS

Claims 1-23 are pending in the instant application. Claims 1-23 stand rejected. Claims 1, 2, 5-13, and 16-23 stand rejected under 35 U.S.C. §102(a) as being unpatentable over United States Patent No. 6,008,493 to Shao et al. in view of the article by Badawi et al. in Phy. Med. Biol. 43 (1998) pg 189-205. Claims 3, 4, 14, and 15 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Shao and Badawi in view of United States Patent No. 6,198,104 to Gregan. Claims 1 and 12 have been amended to incorporate the limitations of now-canceled claims 3-4 and 14-15, respectively, and to more particularly point out that the artificial count data is generated based on the location of the single photon source. Applicants respectfully submit that none of the amendments constitute new matter in contravention of 35 U.S.C. §132. Reconsideration is respectfully requested.

Claims 1, 2, 5-13, and 16-23 stand rejected under 35 U.S.C. §102(a) as being unpatentable over United States Patent No. 6,008,493 to Shao et al. in view of the article by Badawi et al. in Phy. Med. Biol. 43 (1998) pg 189-205. Applicants respectfully submit that this rejection stands obviated in view of the amendments to claims 1 and 12, whereby the limitations of un-rejected claims 4 and 12, respectively, were incorporated therein. Reconsideration and withdrawal of the rejection are respectfully requested.

Claims 3, 4, 14, and 15 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Shao and Badawi in view of United States Patent No. 6,198,104 to Gregan. This rejection is respectfully traversed.

Applicants note that claims 3-4 and 14-15 are now incorporated into independent claims 1 and 12, respectively. Patentability of the pending claims will be addressed based on this rejection of claims 4 and 15.

The present invention provides a model for generating detector efficiency data for a PET scanner using a single photon emitter. Because the measurement of a single photon involves only one detector, the detection model will desirably not contain the multiple of 2 efficiencies. So the present invention, as recited in amended claims 1 and 12 hereinabove, provides an additive model. The additive model is based on the fact that the measurement uses a rotating single photon point source and tracks its position. Photons are detected in detectors at "the other side" (i.e. the source is at one side of the scanner, the detector is at the other). Artificial coincidence count data is generated by taking into account the position of the single photon source.

The count is stored in a sinogram-bin corresponding to the line between the source and the detector. The probability for this detection is proportional to

the efficiency of that detector. However, because the source rotates, at a later time-point, the source will be at the other side of the scanner, and there might be a detection for the same line – but it now was via a detector which was at the other side of the line. Therefore, the total counts in the sinogram-bin will follow the model given in the disclosed eq. 4. Eq. 9 is a simplified version of eq. 4 for the case that the measurement is not the sum of multiple positions of the single photon point source with respect to the detectors. In any case, it is clear that none of the cited references employ efficiency estimating algorithms of either eqs. 4 or 9, as none are directed to a system with a single photon source.

The Examiner cites Shao for disclosing a method of generating detector efficiency data for a PET scanner. Badawi is cited for teaching an efficiency estimation algorithm to calculate data representative of the efficiencies of the detectors in the array. Gregan is cited for disclosing the processing of artificial coincidences. Lastly, the Examiner cites general knowledge of weighted sums.

However, the Examiner acknowledges that while Shao refers to a single photon source, it is not directed to detector efficiencies. Moreover, Badawi is acknowledged not for disclosing Applicants' efficiency algorithm, but for the general proposition of employing an efficiency algorithm. As Applicants previously remarked, applying the Badawi algrorithm to the Shao system would not lead to the present invention because its assumption of a dual-photon (positron

emission) source would actually lead not lead to the claimed invention. Moreover, such a combination would not render the present invention obvious because there is no disclosure, teaching, or suggestion of how to model a single photon source. As was stated in the previous Response:

> **"For example, with a detector out, the (Badawi) eq. 1 model predicts that the counts in all sinogram bins that 'use' that detector will have zero counts. However, for that same case, the (present invention) eq. 4 model says that those bins will not be 0, but will be roughly half of what they would be with a working detector. Therefore, using (Badawi) model 1 will never alert one that the detector is out."**

Therefore, knowledge of the efficiency estimation algorithm of Badawi would not correct the deficiencies of Shao, with a single-photon source, in rendering the present invention obvious, nor would even suggest how to correct for a single photon source.

In getting to the rejection of claim 4, the Examiner further relies on Gregan for teaching the artificial coincidences and processing artificial coincidences as claimed (in then claim 3). However, Applicants respectfully submit that the 'artificial coincidences' of Gregan are entirely different from the artificial counts of the present invention and have no bearing on the present invention.

Applicant respectfully submits that the claims, while broadly interpreted by the Office during examination, must be given the meaning that one of ordinary skill in the art would give them based on the disclosure. The artificial counts of the present invention related to an actual detected photon, not to an artificially generated signal of Gregan.

First, Gregan, like Badawi, is not directed to a single photon source. Where Gregan mentions a 'gamma camera' and SPECT, it is because Gregan concentrates on the case where coincidences are measured between two detector heads of a gamma camera, but this is in reality a PET measurement (with positron annihilation and coincidence measurement). So Gregan always requires a positron emitter. Gregan, moreover, proposes an active circuit for generating 'artificial coincidences' with a rate that can be used to estimate randoms (potentially via singles) of the 'normal' coincidence data which is acquired nearly simultaneously. The random coincidences describe the detection of two photons (within the detection timing window) where the two photons originated from two different positron annihilations. For Gregan, the 'artificial coincidences' are coincidences measured by the circuitry of the scanner between a generated pulse at one detector and a detected photon of a positron annihilation at the other detector. Afterwards, Gregan uses these measurements with multiplicative formula to estimate the amount of random coincidences present in the 'normal' coincidences.

Therefore, the ‘artificial coincidences’ detected by Gregan are very different from the artificial coincidences of a single photon source of the present invention. So, contrary to the Examiner’s position, one of ordinary skill in the art would not look to Gregan for processing the artificial counts of the present invention, because Gregan does not disclose, teach, or suggest the artificial counts of the present invention.

Additionally, Gregan is not directed to correcting efficiency. Gregan never uses the word ‘efficiency’ in the disclosure. Gregan only collects his ‘artificial’ signals into a count data to help correct the resulting image. Gregan states that each of his detectors 1) generates event-based trigger pulses in response to scintillation events and 2) includes a pulse generator which generates the artificial trigger pulses, i.e. those that are not caused by scintillation events. The artificial pulse generators are programmed to activate at specific pulse rates and/or width. Based on these programmed signals, the signals received at a pair of opposing coincidence detectors is compared and if one signal is at a predetermined strength higher than the other, Gregan records both the coincidence signal and a singles signal. The singles data is later correlated for each detector and used to correct the resulting image. Gregan therefore is not concerned with the detector efficiency and one of skill in the art would not be motivated by Gregan to correct detector efficiency.

Therefore, as shown hereinabove, Gregan fails to motivate one to correct the deficiencies of either Shao or Badawi in accordance with the present invention.

Lastly, in rejecting previous claim 4, the Examiner conclusively states that 'weighting said coincidence pairs is well known and conventional in the art" and would correct for the deficiencies of the modified Shao. Applicants respectfully disagree with this conclusion. Each of the references cited by the Examiner for efficiency algorithms are built around the use of positron emitters. As the instant application makes clear, the assumptions required by the cited references do not apply to present invention, where only a single photon source is used. As none of the cited references, either alone or in combination, disclose, teach or suggest an algorithm for processing detector efficiency based on artificial counts for a single photon source, the present invention is not rendered obvious by the prior art. Reconsideration and withdrawal of the rejection are respectfully requested.

In view of the amendments and remarks hereinabove, Applicants respectfully submit that the instant application, including claims 1-2, 6-13, and 16-23, is in condition for allowance. Favorable action thereon is respectfully requested.

Any questions with respect to the foregoing may be directed to Applicants' undersigned counsel at the telephone number below.

Respectfully submitted,

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